

The secret life of a Mediterranean seagrass litter macrofauna community : a history of oxygen.

Remy François¹, Loïc Michel¹, Nicolas Sturaro¹, Thibaud Mascart² and Gilles Lepoint¹

¹ Laboratory of Oceanology; Department of Ecology, Biology and Evolution, Université of Liège, Allée de la Chimie, 3, Building B6C, 4000, Liège, Belgium
E-mail: francois.remy@ulg.ac.be

² Marine Biology research group, Department of Biology, Ghent University, Krijgslaan 281/S8, 9000 Gent, Belgium

Most of the foliar primary production of *Posidonia oceanica*, a major Mediterranean seagrass, sheds in autumn and is exported from the meadow to adjacent areas to form “Exported Macrophytodebris Accumulations”, EMAs. These EMAs are a habitat, shelter and feeding place for an abundant and diverse community of macrofauna. Being very dynamic places and potentially playing a role of transition compartment between water column and sediment, EMAs present high variability in term of physicochemical conditions and more specifically in term of oxygen concentration. Mild to severe hypoxic periods ($2 - 0.01 \text{ mL O}_2 \cdot \text{L}^{-1}$) can be observed *in situ* at different moments of the year, and this variability thus potentially play a structuring role on the macrofauna community. During this study, our main specific questions were (1) Does oxygen stratification occur inside EMAs? (2) If present, how long does it take to observe this stratification? (3) Is the macrofauna impacted and do the dominant species occupy defined positions inside the different micro-habitats?

To assess the importance of this impact, an experimental study was conducted in October 2014 near the STARESO oceanographic station (Calvi, Corsica) using an original “layer-sampling” design. The experimental construction was put underwater inside an EMA for 48 hours at a depth of 8m. Samples were collected (N=8) in a 20cm thick EMA using “sealed” boxes to sample every 5cm, from the sediment, to the water column. Oxygen, nutrients and of course the litter itself (containing the macrofauna) were sampled carefully to make sure no exchange occurred between the 4 different layers.

After data analysis, the assessment was clear: oxygen stratification occurred in less than 48h and oxygen level inside the layer close to the sediment experienced a fast decrease below the hypoxia threshold ($2 \text{ mL O}_2 \cdot \text{L}^{-1}$). Diversity was highly impacted, showing a clear positive link with oxygen concentration. Macrofauna also appeared to follow this oxygen stratification but this response was very species specific. Some species didn’t follow oxygen and are present in every layer and most of them were strongly positively linked to oxygen concentration.

But a few (*Nebalia strausi* and *Athanas nitescens*) were strongly negatively linked to oxygen concentration and were present only in the more hypoxic layers.

This experimentation thus confirmed our *in situ* observations. Oxygen stratification occurred quickly (< 48h) when EMAs were experiencing calm weather. This stratification observed from the water column to the sediment was very marked. Diversity and abundance of most abundant macrofauna species were drastically influenced by this stratification, showing the importance of these micro-habitats in structuring of this macrofauna community.

Keywords: macrofauna; hypoxia; oxygen; seagrasses; *Posidonia oceanica*; invertebrates